

by an American Kestrel (*Falco sparverius*), that began mobbing the Bat Falcon as soon as it had alighted with its prey. This was the only incident of agonistic behavior by the kestrel towards the Bat Falcons despite kestrels being present in the area each day.

The birds caught by the falcons were uncommon or absent from the area immediately surrounding the perch tree. The most common prey species, the Brown-headed Cowbird, was never observed in the vicinity of the perch. The nearest location where cowbirds were observed was at the ranch headquarters approximately 2 km from the area of observation. We saw no prey captured in the vicinity of the perch, though both male and female attacked quarry within 30 m but without success. All but one of the attacks were at Red-billed Pigeons (*Columba flavivestris*), one attempt was made by both male and female together at a flock of Great-tailed Grackles (*Quiscalus mexicanus*). Red-billed Pigeons were common in the perching area and observed each day feeding on a tree approximately 10 m away. The grackles never perched or fed in the area but were common, flying over head.

Since Brown-headed Cowbirds were not observed in the area and the other prey species were uncommon around the perch site this suggests that the falcons travelled up to several kilometers from the perch to capture prey. Beebe (1950) also observed Bat Falcons flying several kilometers to capture their prey. Cade (1982) found that the distance Bat Falcons flew to capture prey was usually less than 100 m from the perch. Kirven (1976) found the maximum distance to be 660 m.

RESUMEN.—Estudiamos un par de halcones de la especie (*Falco rufigularis*) en el estado de Tamaulipas, México. Durante 6 días de observaciones los halcones se posaron

diariamente de 0620 a 0855 y de 1800 a 1900 H en un higuerón (*Ficus* spp.) y consumieron nueve aves de por lo menos cuatro especies, dos *Zenaida macroura*, tres *Molothrus ater*, un *Bombycilla cedrorum*, un *Picoides scalaris*, y dos no identificados. Las aves consumidas nunca se observaron en los alrededores de la percha o se observaron raramente.

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FOOD HABITS OF BREEDING SHORT-EARED OWLS IN SOUTHWESTERN BRITISH COLUMBIA

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Short-eared Owls (*Asio flammeus*) inhabit grasslands and marshes in both the old and new world. In southwestern British Columbia they are an uncommon resident and a local summer breeder (Campbell et al. 1990). The winter diet of Short-eared Owls is well-known because the use of communal roost sites facilitates the collection of pellets (e.g., Kirkpatrick and Conway 1947, Weller et al. 1955). However, pellets are more difficult to find in summer because they are scattered throughout hunting territories and do not accumulate around nests (Clark 1975).

Field studies in Iowa (Errington 1937) and Manitoba (Clark 1975) are the only analyses of the summer diet of North American Short-eared Owls. Here I report the summer diet of Short-eared Owls in southwestern British Columbia based on an analysis of pellets.

STUDY AREA AND METHODS

Breeding Short-eared Owls were studied in the municipality of Delta, British Columbia from May to August 1987. At least three pairs and eight young used the grass

Table 1. Summer diet of breeding Short-eared Owls in British Columbia based on pellet analysis, 1987.

SPECIES	PERCENT OF PREY ITEMS	PERCENT OF TOTAL BIOMASS ^a
<i>Microtus townsendii</i>		
Adult	54.8 (62) ^b	62.3
Juvenile	15.0 (17)	9.2
<i>Microtus</i> spp.	13.3 (15)	15.1
Total <i>Microtus</i> spp.	83.2 (94)	86.6
<i>Peromyscus maniculatus</i>	5.3 (6)	2.1
<i>Sylvilagus floridanus</i>	1.8 (2)	9.3
<i>Ondatra zibethicus</i>	0.9 (1)	
Emberizinae spp.	6.2 (7)	1.9
Coleoptera spp.	2.7 (3)	trace

^a Excluding *Ondatra zibethicus*.

^b Numbers in parentheses.

fields and saltmarsh foreshore near Boundary Bay Airport (49°N 123°W) for hunting and nesting. Every second week I collected fresh pellets from an area of about 2 km² adjacent to the airport that was in the vicinity of two known nest sites. Thus, it is likely that I collected pellets from both adult and juvenile owls. No other raptors bred on this land or consistently used it while hunting, although Northern Harriers (*Circus cyaneus*) occasionally flew over the area. Short-eared Owl pellets can be distinguished from those of harriers by their length and high bone content (Clark 1972, Holt et al. 1987).

Regurgitated pellets are frequently used to study food habits of raptors and pellet contents are indicative of captive Short-eared Owls' diets (Chitty 1938, Clark 1975). Biases in pellet analysis may occur if the prey items cannot be eaten in a single meal (Marti 1974) but most prey of Short-eared Owls are smaller than 70 g. I moistened the pellets before teasing them apart by hand and determined the number of individual mammals based on the number of skulls. Some *Microtus* skulls could not be identified because teeth were missing, and so were classified "*Microtus* spp." Since Short-eared Owls may crush bird skulls and do not necessarily ingest the bill (Johnston 1956), one bird was counted even if the skull was absent when there were feathers in the pellet. To convert prey numbers into biomass, I used mass estimates of voles from Krebs et al. (1976) and of deer mice from a mean of 70 specimens in the Royal British Columbia Museum and the Vertebrate Museum, University of British Columbia. Masses of other mammals are from Banfield (1974). I assumed a mass of 18 g for the sparrows. Because muskrats are probably rare prey, I did not include them in the calculation of biomass in order to obtain a more representative analysis.

RESULTS AND DISCUSSION

Of the 90 pellets collected, 59% were found beneath fenceposts and large driftwood logs that owls used frequently when hunting from a perch or roosting. The re-

mainder appeared to be randomly scattered throughout the fields. The mean number of prey items per pellet was 1.26 (SD = 0.51). This is similar to the 1.21 reported by Holt et al. (1987), but is lower than many of the 24 studies reviewed by Clark (1975) in which the average was 1.67 items per pellet (range 0.78–2.37). The number of prey items in a pellet is inversely related to prey size (Weller et al. 1963). Since *Microtus townsendii* are among the largest species of vole in North America (Banfield 1974) one would expect there to be fewer prey items in the pellets I found.

About 91% of prey items were mammals (Table 1), the most common species in both numbers and biomass being *Microtus townsendii*. A predominance of voles in the diet of Short-eared Owls has been found in most studies, especially in winter when the microtine component usually exceeds 90% (Kirkpatrick and Conway 1947, Clark 1975, Colvin and Spaulding 1983). In comparison with other summer diets, the proportion of voles in this study was between the 63% reported by Errington (1937) in Iowa and 90% reported by Clark (1975) in Manitoba. Other mammals comprised only a small fraction of the diet (Table 1). The adult-sized muskrat skull found in the pellet had a crushed occipital region which is characteristic of the way Short-eared Owls kill prey (Clark 1975). It was thus unlikely to have been scavenged. Although Short-eared Owls are known to eat juvenile lagomorphs (Errington 1937), a muskrat has never been previously reported as prey and probably represents an upper size limit around 800–1000 g. Two juvenile muskrats were eaten by Short-eared Owls in Massachusetts (D. Holt, pers. comm.).

Although the emberizid prey were not identified to species, Savanna Sparrows (*Passerculus sandwichensis*) and Song Sparrows (*Melospiza melodia*) were abundant in the area. Two pellets contained small, cream-colored eggshell fragments. Clark (1975) suggested that juvenile Short-eared Owls might eat passerine eggs while walking through the fields. Alternatively, Short-eared Owls may consume the shells of their own eggs after the chicks hatch or eat female passerines containing eggs.

The diet of Short-eared Owls in southwestern British Columbia is similar to that of the Barn Owl *Tyto alba* (Campbell et al. 1987) and Northern Harrier (Campbell et al. 1990) who are also *Microtus* specialists that use similar habitats. It is likely that these three species compete for the same resources, but crepuscular hunting by Short-eared Owls in this study may offer some degree of temporal separation from the nocturnal Barn Owl and the diurnal harrier.

RESUMEN.—La dieta de verano de buhos de la especie *Asio flammeus* no es bien conocida. Egagrópilas de estos buhos, que estaban en su época reproductiva en el sudoeste de Colombia Británica, fueron colectadas durante el verano de 1986 y fueron analizadas para determinar la dieta. Las egagrópilas fueron analizadas para determinar el número y el peso de las especies que fueron presas. La mayoría de los ítems fueron restos de ratones campestres (*Microtus* spp.) pero la proporción fue menos que aquella que se encontró muchos estudios de las dietas de invierno. Una egagrópila contenía la calavera de una rata amizclera ad-

ulta (*Ondatra zibethicus*), siendo la primera vez que un mamífero tan grande se ha registrado como presa de esta especie de buho.

[Traducción de Eudoxio Paredes-Ruiz]

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